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ASSESSING INTRA-CITY RAINSTORM AND FLOOD RISK: A MULTI-CRITERIA GIS APPROACH FOR DISTRICT-LEVEL EVALUATION

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Abstract

Rainstorm and flood risk have become increasingly severe in recent years. Different from the existing research focusing on evaluating such risk on river basins or cities, this paper presents a GIS (Geographic Information System)-based fuzzy comprehensive evaluation method to assess rainstorm and flood risk at the urban district scale. The novelty lies in constructing an indicator system capturing hazardousness, environmental sensitivity, receptor vulnerability, and mitigation capacity, and integrating AHP and entropy for optimal weighting. Indicator input were projected onto the GIS map and the fuzzy comprehensive evaluation method was employed to generate risk assessment. A case study in City A, China categorizes its six main urban districts into high (Lixia), medium (Shizhong, Huaiyin, Tianqiao) and low risk (Licheng, Changqing) zones. Different zones have various risk compositions with high-risk zone involving higher hazardousness of disaster-causing factors, sensitivity of the disaster environment, and vulnerability of disaster receptors. The model results are validated by sensitivity analysis of indicator weights and overlaying of the generated risk map with City A's historical waterlogging points. The proposed district-scale approach enables detailed insights into sub-city risk distributions and compositions that are largely unaddressed in existing courser-scale evaluations. This work provides a practical tool for guiding local flood management and urban resilience planning.

Key words: analytic hierarchy process, entropy, flood disaster, fuzzy comprehensive evaluation method, geographic information system, heavy rainstorm

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